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ABSTRACT

With the increasing number of part-time and adult students entering universities over the past several years, students who tend not to follow the traditional pattern of study, the task of accurate enrollment predictions has become increasingly difficult. The use of the Statistical Analysis System (SAS) software package to effectively track both traditional and nontraditional students, and identify their specific enrollment patterns, is demonstrated. The enrollment patterns of 1,439 students (mostly female) making up the entering class of 1983 at Mount Saint Vincent University, Canada, were examined. The procedure and results of the SAS analysis are discussed, and tables, charts and graphs illustrate the output. The impact that nontraditional patterns of enrollment can have on the accuracy of enrollment projections is also discussed. The results of the study illustrate this point in three ways: student populations must be divided into distinct groups for analysis; conceptual models of student flow must include re-entry points for students who drop out temporarily; and it is dangerous to assume, in looking at enrollments across years, that students have persisted non-stop across that period. Contains 4 references. (Author/KM)

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USING SAS TO TRACK BOTH TRADITIONAL AND NON-TRADITIONAL PATTERNS OF ENROLLMENT

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ABSTRACT

With the increasing number of part-time and adult students entering universities over the past several years, the task of accurate enrollment predictions has become increasingly difficult - since these students tend not to follow the traditional non-stop, four year pattern of full-time study expected by universities. This paper demonstrates how SAS can be used to effectively track both traditional and 'non-traditional' students and identify their specific enrollment patterns. It then discusses the impact non-traditional patterns of enrollment can have on the accuracy of enrollment projections.

USING SAS TO TRACK BOTH TRADITIONAL AND NON-TRADITIONAL PATTERNS OF ENROLLMENT

With the increasing number of part-time and adult students entering universities over the past several years, the task of accurate enrollment predictions has become more difficult, since these students tend not to follow the traditional non-stop, four year pattern of full-time study expected by universities. Instead of this traditional pattern of study, we are observing the following: a decreasing percentage of students entering university directly from high school; an increasing number studying on a part-time basis; more adults returning to education after working either at home or in the paid work force; an increasing number of students taking courses out of interest or for personal development rather than to obtain a specific credential; and a large number of students interrupting their studies for one or more terms, for a variety of reasons. In short, we are seeing patterns of study which are very different from what university officials have traditionally expected of their students.

No longer can we expect all university students to enter at the age of 18 and study continuously, on a full-time basis, until the requirements for their credential are completed. For this reason, projecting enrollments, calculating retention rates, and tracking individual students over time, has become more complex.

In an excellent article on longitudinal enrollment analysis Ewell (1987) breaks down the task into three major segments: 1) to identify basic principles and concepts necessary to construct a longitudinal model of student progress that indicates how students of different kinds move into, through and out of the institution; 2) to construct a longitudinal file that can be used to track students progress over time; and 3) to collect supplemental data through the use of periodic surveys.

This paper is primarily concerned with the second segment, the construction of a longitudinal file. However, in our discussion we will take a brief look at Ewell's (1987) conceptual model of student progress.

Longitudinal studies may not be the easiest to carry out. As Ewell (1987: 5) points out: "Cohort survival models are relatively easy to describe, but it may prove a challenge to obtain the data needed to estimate them." Nevertheless, a review of the student attrition/retention literature (Tinto, 1975; Lenning, 1982; and Terenzini, 1987) indicates a need for such studies. Consequently, the purpose of this paper is to describe how to use what Ewell (1987, p. 7) refers to as "term enrollment" files and SAS, a powerful data management and statistical package, to construct a longitudinal file for tracking both traditional and non-traditional students in order to identify their specific patterns of enrollment.

METHOD

Subjects

This study examined the enrollment patterns of 1439 students who made up the entering class of 1983 at Mount Saint Vincent University. Mount Saint Vincent University is a small urban Canadian university of approximately 4,000 students, aimed primarily at undergraduate education (96% of the students are undergraduates). The Mount is unique as Canada's only university concerned primarily with the education of women, and, as a result, 84% of the student body is female. The Mount's student population afforded the authors an excellent opportunity to study the enrollment patterns of 'non- traditional' students since, 44% of its student body study part-time, 38% are thiry years of age or older and fewer than 37% come to the university directly from high school.

Procedure

Many colleges and universities, including this one, must collect information from several different student datafiles in order to obtain complete student records. Due to the inflexibility of Mt. St. Vincent University's student information system, Statistics Canada's University Student Information System (USIS) datafiles were used. These files contain enrollment

data captured on Decemeber 1st of each academic year. The files selected were those of 1983, 1984, 1985, and 1986. The annual files were merged, using SAS, to provide cummulative student records from 1983 to 1986. The combined dataset was analyzed, again using SAS, to examine the patterns of enrollment (continuous/interrupted, full-time/part-time) of students who entered the university for the first time in 1983 (thus, those with 1983 student numbers). These students were tracked individually from 1983 to 1986.

Table 1 contains the SAS program which was used to merge the annual datafiles, select out the entering class of 1983, and then analyze each student's pattern of enrollment.

TABLE 1

SAS PROGRAM FOR CONSTRUCTING LONGITUDINAL STUDENT DATA FILES

```
*
STEP 1:  To combine the 4 annual datafiles into a permanent
         cummulative dataset which is sorted by student
         number and report date.
                                                          ;
LIBNAME usis '[murrayj.usis]';
DATA usis.combine;
  MERGE usis.dat83 usis.dat84 usis.dat85 usis.dat86;
  BY studid repday;

*
STEP 2:  To select only those students with 1983 student
         numbers (entering class of 1983) from the combined
         dataset.
                                                          ;
```

```
DATA subset;
  SET usis.combine;
  IF 83000000<=studid<83999999;

*
STEP 3:  In order to use the FIRST. and LAST. features of
SAS the dataset first had to be sorted by the BY variable
which would be used with FIRST. and LAST..
                                                          ;
PROC SORT data=subset;
  BY studid;

*
STEP 4:  Using four unique numbers (unique when summed for
         all possible combinations) a new variable was
         created to represent each of the fifteen possible
         patterns of study (continuous/interrupted) for each
         individual student.  The pattern is indicated by
         the value of the variable TOTAL.
                                                          ;
DATA usis.pattern;
  SET subset;
  BY studid;
  IF repday=83 then test=1;
  IF repday=84 then test=3;
  IF repday=85 then test=5;
  IF repday=86 then test=10;
  IF FIRST.studid then TOTAL=0;
  TOTAL+test;
  IF LAST.studid;

*
STEP 5:  A frequency procedure was then run to indicate the
         number of students with each pattern (continuous/
         interrupted) of study.
                                                          ;
PROC FREQ;
  TABLES TOTAL;     *(FORMATTED OUTPUT PROVIDED IN TABLE 2);

*
STEP 6:  The same logic was applied again, as in STEP 4, to
         indicate the full-time/part-time pattern of study
         for individual students and again the PROC FREQ
         was used to provide the number of students with
         each pattern (full-time/part-time) of study.
                                                          ;
DATA usis.status;
  SET subset;
  BY studid;
  IF regist=15 or regist=16 or regist=18 then status=1;
  IF regist=26 then status=10;
  IF FIRST.studid then SUM=0;
  SUM+status;
  IF LAST.studid;
```

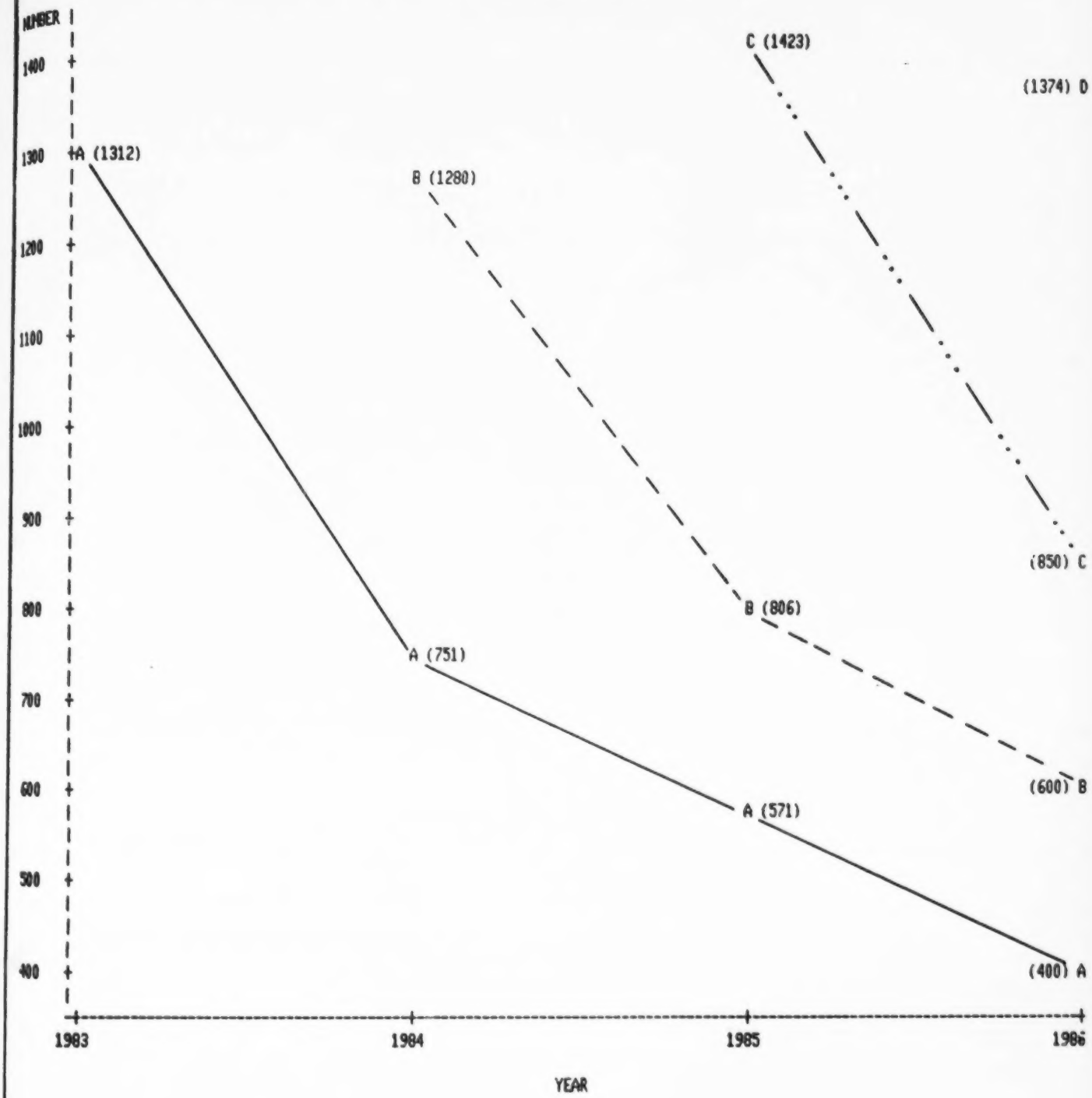
```
PROC FREQ;
  TABLES SUM;    *(FORMATTED OUTPUT PROVIDED IN TABLE 3);

*_____________________________________________________
A second program was written to combine the two different
patterns of study created above so that we could look at
an individual students pattern of registration (continuous/
interrupted) along with their pattern of status (full-time/
part-time).
_____________________________________________________;
LIBNAME usis '[murrayj.usis]';
DATA merged (keep=studid TOTAL SUM);
  BY studid;
PROC SORT;
  BY TOTAL;
PROC FREQ;
  TABLES SUM;
  BY TOTAL;     *(OUTPUT AVAILABLE FROM THE AUTHORS)
```

RESULTS

Using the combined datasets of 1983 to 1986, Fiqure 1 depicts the number of students who entered the university, during the fall term, in each of the four years. Also depicted are the number of students, from the total entering class, who remained and/or appeared in the subsequent fall statistics. Thus, we can see that 1312 students entered in the fall of 1983 and that 751 (57%) students with 1983 student numbers were present in December 1984, 571 (43%) were present in December 1985 and 400 (30%) remained in December 1986. Consequently, it would appear that 30% of those who first registered in 1983 were still registered 4 years later.

FIGURE 1: TOTAL ENROLLMENT BY YEAR OF ENTRY TO MSUU



A = CLASS OF 83 B = CLASS OF 84 C = CLASS OF 85 D = CLASS OF 86

A word of caution, however, is needed when interpreting these data. We may not be counting the same students from year to year and therefore cannot conclude that the 400 students remaining in 1986 had persisted, non-stop, throughout the four years under study. The term(s) during which a student registers for classes and the number of students who stop-out each year will affect the accuracy of these results. For example, there were 1439 students with 1983 student numbers in The Mount's combined dataset (1983-86) compared to 1312 students in the December 1983 count. This means that 127 students entered this institution for the first time during either the summer 1983 or winter 1984 term (thus accounting for their 1983 student numbers) but did not register for any classes during the fall 1983 term (thus explaining why they are not included in the December 1983 count). However, these 127 students had to have registered in at least one fall term between 1984 and 1986, in order to be included in the combined dataset. Those missing altogether are the students with 1983 student numbers who, for whatever reason, never registered for classes during the fall of 1983, 1984, 1985 or 1986.

Table 2 is proof that we cannot assume students today enter university and continue non-stop until graduation or until they drop-out completely. Apparently there are a number of students who choose to stop-out for one or more terms for a variety of reasons.

TABLE 2

ENTERING CLASS OF 1983

BY YEARS ATTENDED

YEARS ATTENDED	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
1983 ONLY	604	42.0	604	42.0
1984 ONLY	36	2.5	640	44.5
1983 & 84	167	11.6	807	56.1
1985 ONLY	12	0.8	819	56.9
1983 & 85	21	1.5	840	58.4
1984 & 85	18	1.3	858	59.6
1983, 84 & 85	181	12.6	1039	72.2
1986 ONLY	10	0.7	1049	72.9
1983 & 86	17	1.2	1066	74.1
1984 & 1986	8	0.6	1074	74.6
1983, 84 & 86	26	1.8	1100	76.4
1985 & 1986	6	0.4	1106	76.9
1983, 85 & 86	18	1.3	1124	78.1
1984, 85 & 86	37	2.6	1161	80.7
ALL 4 YEARS	278	19.3	1439	100.0

Table 2 shows that 42% of the 1983 students appear only in the December 1983 statistics; 13% appear during 1983, 1984 and 1985 (a traditional non-stop three year pattern of study); and 19% appear in all four years (a traditional non-stop four year pattern of study). Thus, less than 35% of the student body seems to follow a traditional pattern of study. It is of course interesting to note that every one of the 15 possible combinations of years of study was represented by these students, therefore demonstrating the great diversity within todays student population.

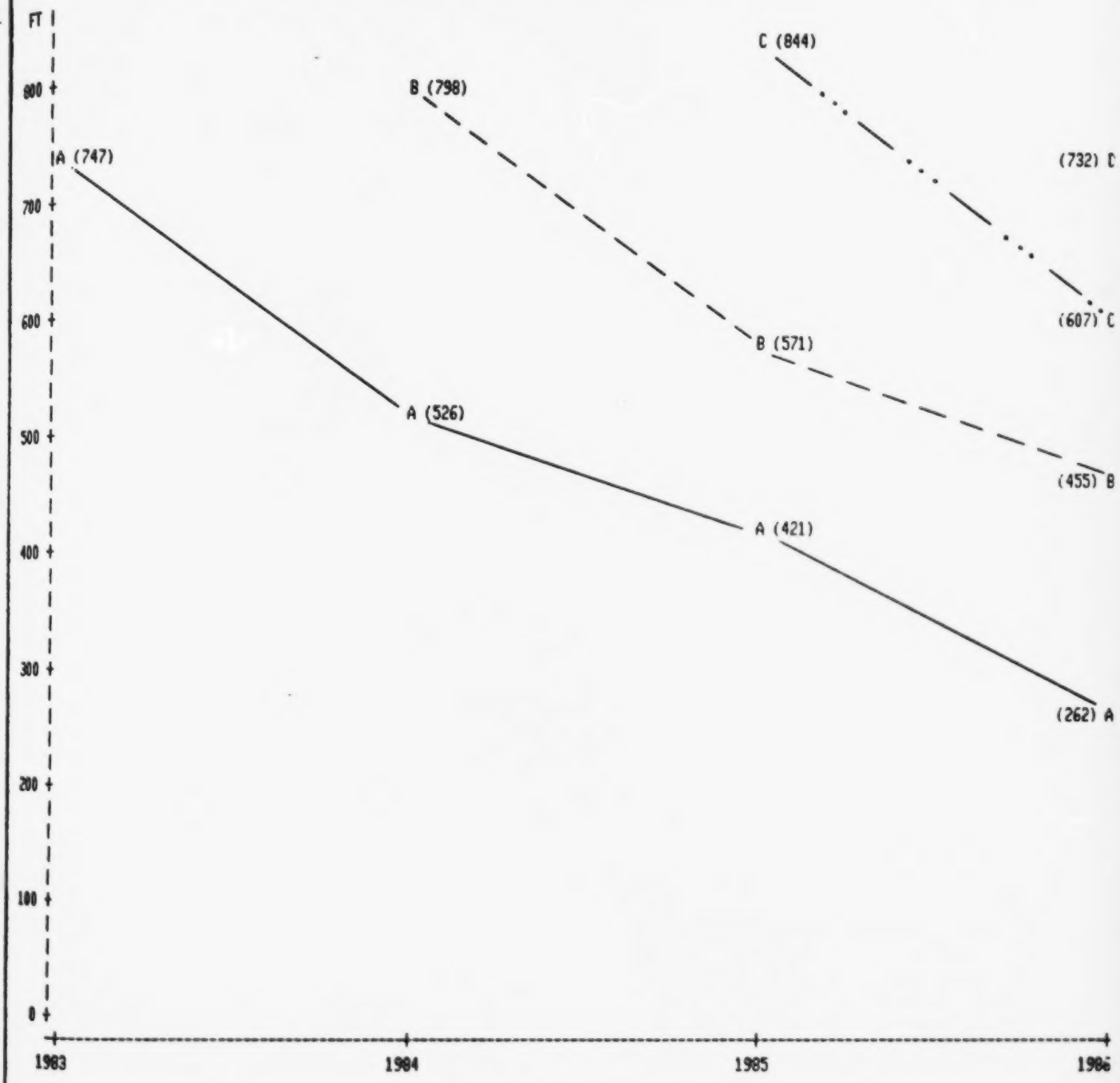
Dividing the student body into full-time and part-time adds even further complexity. Figures 2 and 3 provide us with similar information to that provided in Figure 1 except this time we are looking at full and part-time students separately rather than total enrollments.

Figure 2 looks only at full-time students and shows a 30% decrease in the number of full-time students with 1983 student numbers still registered in 1984 and an overall decrease of 65% in full-time students with 1983 student numbers between 1983 and 1986. These findings are as one would expect for a 4-year public institution, according to Terenzini (1987).

Figure 3 deals only with part-time students and shows a 60% decline in the number of part-time students with 1983 student numbers still registered in 1984 and an overall decline of 76% between 1983 and 1986. Again we must remember that we may not be counting the same students from year to year because not only do they drop in and out of the system, but they also change from full-time status to part-time status and vice versa. Thus, assuming that we are counting the same full-time or part-time students from one year to the next is even more suspect than counting all students combined.

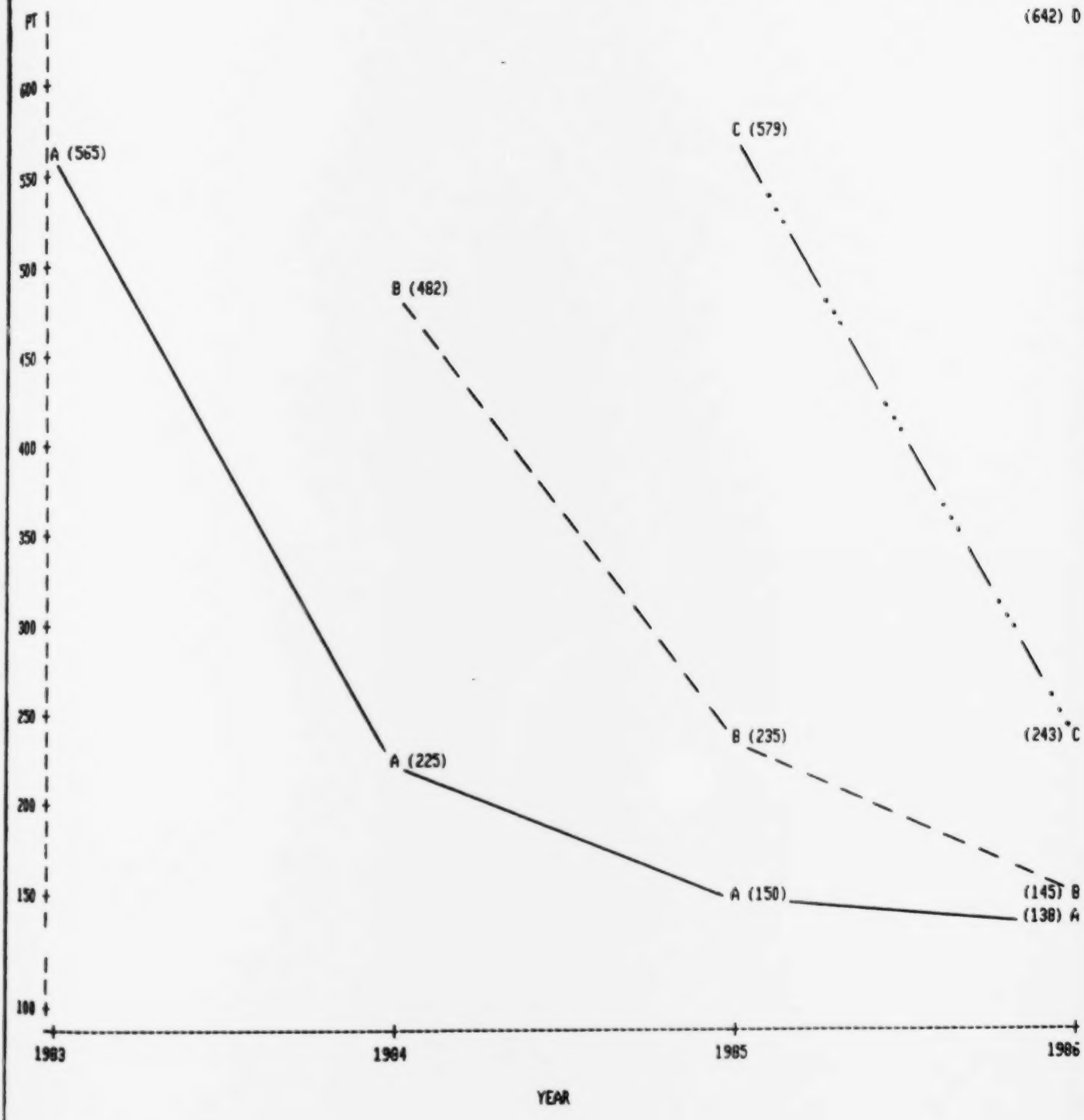
Table 3 demonstrates that the information provided in Figures 2 and 3 is not as straightforward as it might appear. Instead it

FIGURE 2: FULL-TIME ENROLLMENT BY YEAR OF ENTRY TO MSVU



A = CLASS OF 83 B = CLASS OF 84 C = CLASS OF 85 D = CLASS OF 86

FIGURE 3: PART-TIME ENROLLMENT BY YEAR OF ENTRY TO MSVU



A = CLASS OF 83 B = CLASS OF 84 C = CLASS OF 85 D = CLASS OF 86

is obvious that students do change their registration status from full-time to part-time and vice versa. Again every possible combination is represented.

TABLE 3

ENTERING CLASS OF 1983

BY REGISTRATION STATUS FOR 1983 TO 1986

REGISTRATION STATUS	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
FT 1 YEAR	222	15.4	222	15.4
FT 2 YEARS	117	8.1	339	23.6
FT 3 YEARS	155	10.8	494	34.3
FT 4 YEARS	186	12.9	680	47.3
PT 1 YEAR	440	30.6	1120	77.8
FT 1 YEAR, PT 1	40	2.8	1160	80.6
FT 2 YEARS, PT 1	34	2.4	1194	83.0
FT 3 YEARS, PT 1	52	3.6	1246	86.6
PT 2 YEARS	80	5.6	1326	92.1
FT 1 YEAR, PT 2	16	1.1	1342	93.3
FT 2 YEARS, PT 2	4	0.3	1346	93.5
PT 3 YEARS	57	4.0	1403	97.5
FT 1 YEAR, PT 3	3	0.2	1406	97.7
PT 4 YEARS	33	2.3	1439	100.0

NOTE: FT = Full-time studies and PT = Part-time studies

It is also significant that almost 31% of the students entering in 1983 studied part-time for only one year, while 11% studied full-time for three years and 13% were full-time students for all four years. Thus, at most, 24% of the entering class of 1983 had what one would consider a traditional pattern of enrollment. We say 'at most' because it is possible that those

studying full-time for three years did not study continuously.

It is not until we combine the years of study with a student's registration status that we really know how many students have followed a traditional pattern of enrollment. In doing this we discovered that slightly less than 23% of the entering class of 1983 at Mount Saint Vincent University followed traditional patterns of enrollment.

DISCUSSION

The results of this study show us how non-traditional enrollment patterns affect enrollment projections and attrition/retention calculations in three ways. First, these results make it necessary, when projecting enrollments or calculating student attrition/retention rates, to divide the student population into distinct groups. For example, the results of this study showed, full-time and part-time student attrition/retention levels were not the same. There was a much higher attrition rate for part-time students which was hidden when one looked only at TOTAL enrollments. Thus, it is important when tracking students over time to look at the enrollment patterns of students arranged in groups which are of particular interest to each institution. In our case we were interested in the difference between the

enrollment patterns of full-time and part-time students, while others may be interested in whether there is a difference between the enrollment patterns of male/female, white/minority, 25 and under/over 25, Arts/Science, etc..

Secondly, the results of this study also demonstrate that it is important when developing conceptual models of student flow process', such as Ewell's (1987, p. 4), that we include re-entry points for students who stop-out. Stop-outs are students who, for whatever reason, leave the university for a period of time before returning to complete their studies. Stopping-out can take place a number of times before the student completes his/her studies or drops-out completely. This definition of a stop-out differs from that of Terenzini (1987) in that we recognize that not all students who stop-out will eventually graduate. We recognize that the educational goals for some students, including those who stop-out, can be self-development and not to receive a particular credential.

Finally, the results of this study point out the danger when asking the global question "How many students who entered the institution in year X are still registered in year N?" of assuming that the students still registered in year N had persisted non-stop to that point in time. This assumption becomes even more dangerous when looking at groupings of students whos membership could change over time. An example of such a group is the full-time and part-time grouping examined in this

study. One cannot assume that the full-time students present in year N are the same full-time students that were present in year X. Thus, it appears that longitudinal data files which track individual student's patterns of enrollment over time are needed.

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